GRANULAR AGGREGATE RESOURCES OF THE MADAWASKA PANHANDLE, NORTHWESTERN NEW BRUNSWICK

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Minerals and Energy Division

Department of Natural Resources and Energy

New Brunswick

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ABSTRACT

Reserves of granular aggregate material in the Madawaska Panhandle of northwestern New Brunswick are estimated at 9 million m^3. Most of the material occurs as ice-contact deposits in the valleys of the St. Francis River and of Caron Brook and as outwash and alluvial terraces in the Saint John River valley.

The aggregate is of poor to good quality.

RÉSUMÉ

On évalue à 9 million m^3 le volume des réserves de granulat présent à l'intérieur de l'enclave nord-ouest du comté de Madawaska. Ces réserves sont surtout concentrées dans les dépôts de contact glaciaire de la rivière Saint-François et du ruisseau Caron et dans les terrasses fluvioglaciaires et alluviales de la valée de la rivière Saint-Jean.

Le granulat est de qualité bonne à médiocre.

INTRODUCTION

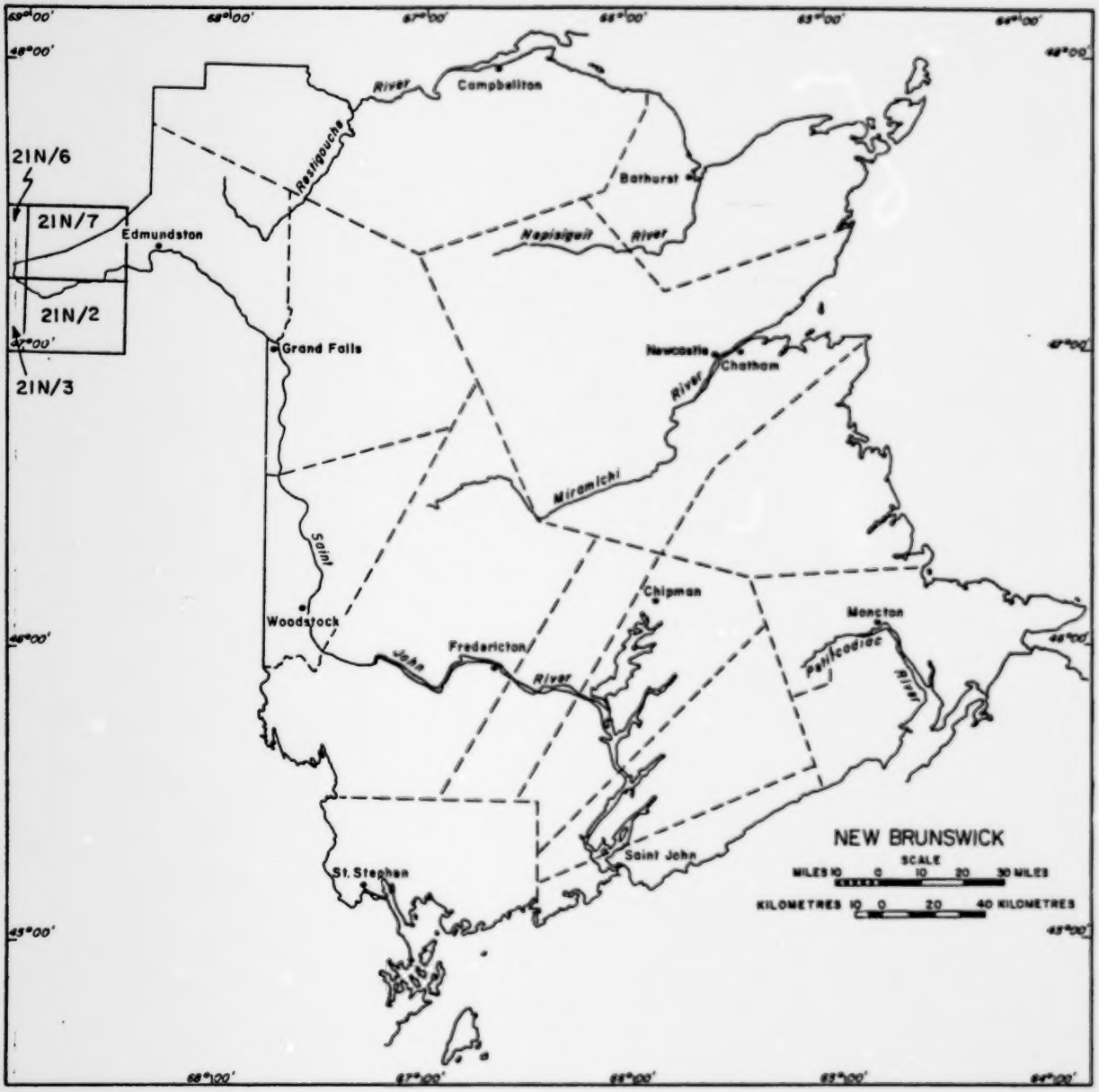
This report summarizes the results and findings of field investigations undertaken during the summer of 1985. The objective of the study was to provide basic information on the distribution, extent, thickness, and quality characteristics of granular aggregate deposits. The report is directed to both producers and consumers of granular aggregates in their search for workable deposits, as well as to land-use planners concerned with efficient resource utilization.

LOCATION OF THE STUDY AREA

The area under investigation is located in the Madawaska Panhandle of northwestern New Brunswick (Figure 1) and comprises the following NTS map areas: Connors (21 N/2), Little Black River (21 N/3), Estcourt (21 N/6), and Lac-Baker (21 N/7).

PREVIOUS STUDIES

Gauthier (1982; 1983) mapped the area as part of a regional study of the surficial geology of northern New Brunswick. The results of that study, published by the Geological Survey of Canada, comprise a report and a series of 1:100 000 scale maps covering the area north of latitude 47°00'N. Rampton et al. (1984) have published a report on the Quaternary geology of New Brunswick as well as a 1:500 000 scale surficial geology map of the Province. Davies and Seaman (1983) mapped the geology of the village of Saint-François-de-Madawaska. Soils of the area have been examined by Langmaid et al. (1980).



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PHYSIOGRAPHY

The map area lies totally within the Saint-François Hills (Figure 2), a physiographic subdivision of the Edmundston Highlands (Rampton et al. 1984) and a part of the Appalachian Region of Canada (Bostock 1970).

The landscape is hilly and the relief is commonly between 150 m and 210 m. Touladi Mountain is the highest point of land at 521 m. Ridges and valleys, many with a northwest-southwest orientation, show the effect of the passage of glaciers. The area is generally well drained and all waterways flow into the Saint John River. Several lakes occupy the valleys of the St. Francis River and of Caron Brook where glaciofluvial deposits act as dams.

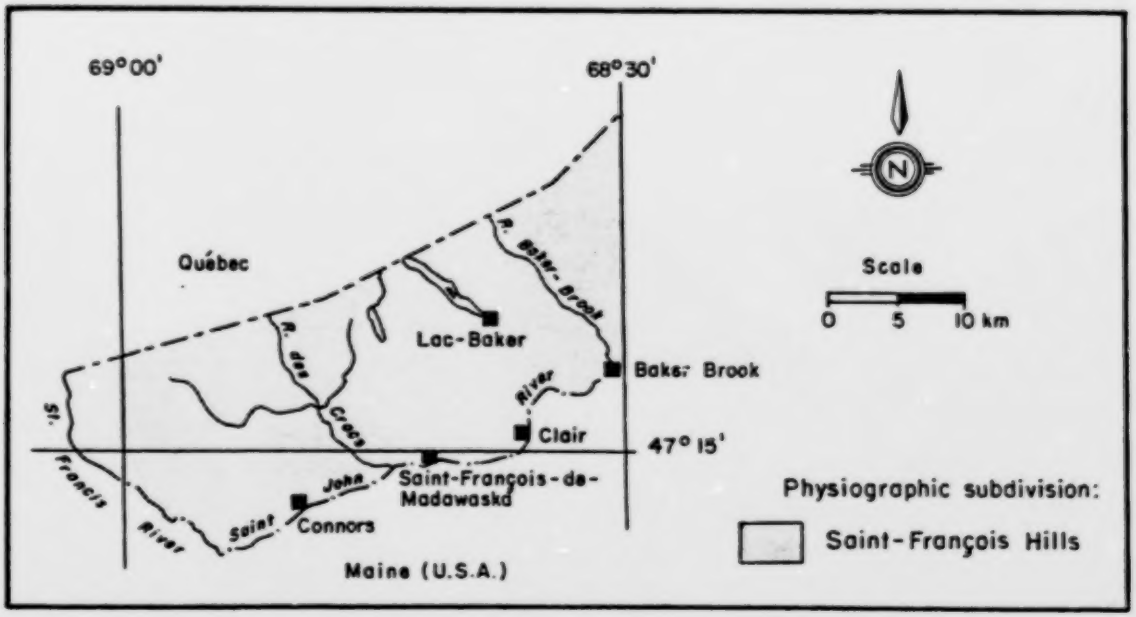

FIGURE 2. Physiography of the Madawaska Panhandle.

BEDROCK GEOLOGY

The map area is underlain by Lower Devonian sedimentary rocks of the Temiscouata Formation. These rocks consist principally of micaceous siltstone and slate that have been compressed in a series of upright folds that display a well-developed, vertically dipping, northeast-striking cleavage (St. Peter 1977).

SURFICIAL GEOLOGY

Rampton et al. (1984) and Gauthier (1983) have summarized the sequence of events that ultimately led to the deglaciation of northwestern New Brunswick.

Striations in the map area are generally oriented northwest-southeast. Only at two sites could direction of ice movement be positively determined. Observations indicate that two opposing ice flows affected the area.

Gauthier (1980) has shown that the northwesterly flow is the youngest and suggested that it resulted from the late Wisconsinan activity of a local ice centre located in northern Maine and New Brunswick. The older southeasterly movement was related to the activity of the Laurentide ice sheet which is reflected in the relative abundance of Canadian Shield erratics in the glacial deposits of the area.

The map area was deglaciated in the early stages of the Plaster Rock Phase (Rampton et al. 1984), about 12 000 years B.P.

GRANULAR AGGREGATE RESOURCES

FIELD AND LABORATORY METHODS

Information used in the determination of deposit boundaries and thicknesses was obtained by the examination of gravel pit faces and other natural and man-made exposures (see Appendix A).

Samples of granular materials were collected from available exposures with a sample-site distribution designed to provide a reliable assessment of material quality in the major deposits. Care was taken to obtain samples that were as representative as possible. All samples were wet-sieved to accurately determine the proportion of fine particles (less than 75 um). Supplementary data obtained from the Department of Transportation (DOT) were included in Appendix A. This includes subsurface data obtained from augering operations and laboratory results of various tests performed on the granular aggregate material.

The average material depths used for volume calculations were determined by projecting the depths observed in pit excavations to areas beyond the pit boundaries, with the aid of geological and topographic observations on the ground and from a study of the aerial photographs. Confidence in the reserve figures is affected by the reliability of material thickness data and of deposit boundaries. In no case can reserve figures be absolutely definitive. Traditional exploration methods, including detailed test-pitting or drilling with power equipment are required for accurate evaluation of reserves.

QUALITY LIMITATIONS

The potential of many local granular aggregate deposits for use as high-specification aggregate is limited by three major factors:

1) **Fine particles**: A high content of fine particulate matter (finer than 75 um) renders the material unsuitable for many uses, at least in the pit-run state. Washing can adequately lower the fines content but doing so increases the cost of exploitation.

Alluvial deposits and some ice-contact deposits are specially affected by this condition.

2) **Clast lithotypes**: High-specification coarse aggregate should consist of hard, strong, uncoated, durable particles of crushed stone or gravel. The soft and highly cleaved slates and siltstones occurring in the map area are generally considered to be unsuitable parent material for the granular deposits that occur in the region.

The poor lithological character of the bedrock is the principal factor limiting the quality of the deposits in the area. The friability of the clasts is illustrated by high abrasion losses and the highly cleaved nature of the bedrock is reflected in the abundance of flat, shingle-like clasts found in the gravel deposits. The Los Angeles abrasion loss values range from 21.8 to 49.3 per cent.

3) **Alkali-reactivity**: Fine aggregate for use in concrete that will be subject to frequent wetting, extended exposure to humid atmosphere, or contact with moist ground should be free

of reactivity with alkalis in cement which may produce excessive expansion in, or cause deterioration of, the concrete. Lithotypes which are potentially reactive include felsic extrusives, quartzite, and chert. These rock types are not commonly found in the map area.

A few deposits have been tested by DOT and the results are included in the data summary sheets in Appendix A. Soundness values, obtained from DOT laboratory results, range in values from 0.8 to 9.6% (for stone).

The soundness of pebbles determined in the lithological analyses (see Appendix A) is a relative measure of the mechanical durability of the clasts based upon the lithotype. This test should not be confused with quantitative soundness tests employing sodium or magnesium sulphate.

SOURCES OF GRANULAR AGGREGATE

The significant deposits of granular aggregate are limited to the valleys of the Saint John River and its major tributaries (Plate 86-228; Appendix A).

The Saint John River Valley: Alluvial and glaciofluvial deposits have been worked as sources of sand and gravel along the length of the Saint John River but significant reserves are limited to the large terrace occurring between Val Oakes and Pelletiers Mill, at the mouth of Rivière des Crocs (N2-4). Other favourable extraction sites include a narrow kame terrace at Saint-François-de-Madawaska (N2-105) and an outwash delta at

the mouth of Caron Brook (N7-108). The extraction potential of the terrace at Clair is limited.

The St. Francis River Valley: The river valley consists of a chain of lakes dammed by glaciofluvial deposits. The deposits are poorly exposed and the upper reach of the valley is not easily accessible (Cross Lake-Grew Pond area). A deltaic landform located at the mouth of English Tuladi Brook (N2-101) offers some potential. Over 2 million m^3 of aggregate are present within the ice-contact deposit that extends between Glasier Lake and the mouth of the St. Francis River (N2-1).

The Caron Brook Valley: Several ice-contact deposits have been intensively used as sources of granular aggregate (N7-8, N7-9, N7-115) between Lac-Baker and Portage-du-Lac. Reserves are rapidly being depleted or are becoming inaccessible because of land-use conflict.

Other Deposits: Small eskers and secondary ice-contact deposits occupy many of the small valleys. The Grew Brook (N2-2), Rocky Brook Lakes, Rivière Baker-Brook (N7-119, N7-121, N7-10, N7-11), and Ruisseau Petit-Reed (N7-14) ice-contact deposits are such examples.

Some deposits that contain significant reserves of granular aggregate, but, due to lack of exposures or relative inaccessibility, have not been studied in detail, include the esker in the Cedar Brook valley north of Lac Unique and the Petite-Rivière-à-la-Truite esker (N7-127).

The Val-Lambert ice-contact deposit (N7-13, N7-123) is locally an important source of aggregate, but the high slate content of the gravel is a quality-limiting factor.

CONCLUSIONS

Recoverable reserves of granular aggregate material in the study area are estimated at 9 million m^3.

Reserve estimates do not completely account for the effect of various physical, cultural, or economic factors which limit or restrict access to these reserves. Deeply buried deposits have not been considered.

Some deposits that were too small to be considered a reserve were not included in the total estimate, but may represent valuable resource deposits for local construction and road improvement activity. These small deposits will naturally assume a more important role based upon their proximity to end use.

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APPENDIX A

DESCRIPTION OF OBSERVATION SITES

LOCATION:	N2-1	**NTS:**	21 N/2
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Road cut	**PARISH:**	Saint-François
STATUS:	Undeveloped	**UTM:**	035 281

SECTION DESCRIPTION & COMMENTS:

Road cuts expose 3 to 4 m of cobbly pebble gravel with some sand. The material is texturally variable, but generally coarse. The sample represents the finer grade available. The maximum size of clasts observed was 30 cm. The pebbles are flat and rounded. The sorting is moderate.

Total reserves of aggregate material in the St. Francis River valley are evaluated as follows:

Lac Beau to Grew Pond: 1 million m^3; largely unexplored esker system.

Glasier Lake delta: 300 000 m^3; largely unexplored outwash deposit (see N2-101).

South part of Glasier Lake to mouth of St. Francis River: 1 million m^3; conservative estimate of the reserves found within the ice-contact system (esker). More material can probably be found within the alluvial unit which may, locally, contain a core of ice-contact or morainic material.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.	92.8	87.6	79.9	60.4	33.3	8.6	2.8	1.2	1.1	1.0	0.9

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 47%	Sound Lithotypes 53%
sandstone and siltstone 44; weathered 3	quartzite 26; sandstone and siltstone 25; quartz 2

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
			2.3 million

LOCATION:	N2-2	**NTS:**	21 N/2
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Road cuts	**PARISH:**	Saint-François
STATUS:	Undeveloped	**UTM:**	058 287

SECTION DESCRIPTION & COMMENTS:

A long, sinuous esker occupies the upper reach of the Grew Brook valley. The material is texturally extremely variable, laterally and vertically, but in general, the largest clasts are in the pebble-size range. There are some cobbly beds. The sorting is moderate and the clasts are mostly flat-shaped.

No paleoflow direction could be determined, but a deltaic landform at the mouth of Grew Brook suggests a southerly flow of water.

Because of the overall textural variability of the deposit, the sample collected was not representative. The northern segment offers the best potential.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.	97.0	94.0	91.7	76.3	58.6	38.6	23.9	12.0	7.4	4.7	2.6

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 30%	Sound Lithotypes 70%
sandstone and siltstone 26; weathered 4	quartzite 33; sandstone and siltstone 32; quartz 5

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
1.5	1.0	3	30 000

LOCATION:	N2-3	**NTS:**	21 N/2
TYPE OF DEPOSIT:	Alluvial	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Saint-François
STATUS:	Active on demand	**UTM:**	105 266

SECTION DESCRIPTION & COMMENTS:

A pit has been opened into a well-terraced alluvial deposit. The main section measures 4 m in height and exposes the following material:

1 m Gravel: Horizontally bedded sand and moderately sorted pebble gravel. Clasts are flat. Sample A was obtained from this unit.

3 m Sand: Stratified, well-sorted sand and fine sand to silt laminae; horizontal to subhorizontal bedding. Sample B was obtained from this unit; note the high proportion of silt.

The lower unit may represent the distal portion of the Foley Brook delta. The upper gravel bed may represent a channel of the proto-Saint John River and an initial stage of downcutting.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass. A	95.4	92.1	85.3	66.2	50.6	35.5	25.7	11.5	2.9	0.8	0.4
B			100.0	99.2	96.5	89.5	81.9	72.0	59.9	37.4	21.2

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 47%	Sound Lithotypes 53%
sandstone and siltstone 35; weathered 12	sandstone and siltstone 23; quartzite 21; quartz 9

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
Outwash: 8	3	4	120 000
Alluvium: 62	6	2	120 000

LOCATION:	N2-4	**NTS:**	21 N/2
TYPE OF DEPOSIT:	Outwash	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pits	**PARISH:**	Saint-François
STATUS:	Active on demand	**UTM:**	170 300

SECTION DESCRIPTION & COMMENTS:

Section heights range up to about 3 m. In general, about 0.5 m of fine gravel and sand overlies coarse sandy pebble gravel. Flat pebbles dominate in the medium to fine gravel. Larger fragments are more spheroidal. Rounding is good in all cases. The bedding is crudely horizontal and a paleoflow of 040° is inferred from cross-bedding in the sand beds.

Other pits have been opened in the outwash (alluvial?) deposit and several have been examined by DOT. Some of the results are as follows (DOT 1978):

Los Angeles abrasion loss: range 21.8% to 24.0%
Percentage finer than 75 um: range 1.2% to 3.5%; mode 1.5%
Soundness loss: stone 0.80; sand 0.75
Sand equivalent value: 77

The material was approved for borrow, subbase, and seal aggregate.

The lowest terrace has not been included in the reserves estimate because it is still an active alluvial surface, subject to periodic flooding. The volumes were calculated for the higher terraces located west of Rivière des Crocs, upstream to Caton Island.

About 500 m east of this location, two pits are being worked on a demand basis. Sections expose 6 to 7 m of sand and gravel. Béton Brunswick operates a crusher and a cement mixing unit. Stockpiles of crushed aggregate are present on site.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.	96.1	94.0	85.7	70.4	57.6	44.4	31.9	12.7	2.4	1.0	0.4

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 32%	Sound Lithotypes 68%
sandstone and siltstone 23; weathered 9	quartzite 35; sandstone and siltstone 26; quartz 6; felsic intrusive 1

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
110	High terrace 15 Low terrace 5	3 2	450 000 100 000

LOCATION:	N7-5	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Glaciofluvial	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Saint-François
STATUS:	Active on demand	**UTM:**	153 358

SECTION DESCRIPTION & COMMENTS:

A small pit exposes sections up to 8 m in height. The material consists of sand and fine pebble gravel, well-stratified. The sorting is moderately good. Clasts are generally well-rounded, but the smaller pebbles are platy.

This deposit is interpreted as a deltaic landform. Foresets dipped at 30° in the 290° direction.

Aerial photograph examination suggests the presence of an esker about 2 km northeast of this locality, in the Carr Brook valley.

MECHANICAL ANALYSIS:

sieve	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.	100.0	95.8	91.2	81.1	65.9	51.7	35.9	28.6	7.5	2.0

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 59%	Sound Lithotypes 41%
sandstone and siltstone 55; weathered 4	sandstone and siltstone 21; quartzite 13; quartz 7

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
20	10	3	300 000

LOCATION:	N7-6	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Saint-François
STATUS:	Active on demand	**UTM:**	202 394

SECTION DESCRIPTION & COMMENTS:

The pit exposes up to 7 m of glaciofluvial material varying from massive well-sorted medium sand to poorly sorted silty gravel (with striated clasts), locally resembling flow till. The bedding is faulted and contorted. Wide lateral and vertical textural variations are observed. Clasts are generally rounded to well-rounded and the average size in the section is 2 cm; the maximum observed size was 30 cm.

The material was used for the foundation works of nearby poultry and piggery farm buildings.

The wide valley between the head of Mill Stream and Lac Unique may contain some glaciofluvial material.

An inactive pit (not visited), located about 500 m west of this locality, probably supplied borrow material of ablation or flowtill origin.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% A pass.			100.0	98.2	95.8	94.0	93.1	91.5	86.8	47.5	19.6
B	100.0	96.8	93.9	85.9	73.8	64.8	60.2	53.5	45.6	32.5	21.9

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 35%	Sound Lithotypes 65%
sandstone and siltstone 29; weathered 6	sandstone and siltstone 37; quartzite 21; quartz 7

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
18	1.5	3	45 000

LOCATION:	N2-7	**NTS:**	21 N/2
TYPE OF DEPOSIT:	Outwash	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Clair
STATUS:	Abandoned	**UTM:**	262 319

SECTION DESCRIPTION & COMMENTS:

An abandoned pit, opened in a glaciofluvial delta at the mouth of Ruisseau Vasseur, exposes 2 to 3 m of gravel. DOT (1983) tested the material and obtained the following results:

Los Angeles abrasion loss: range 30.4% to 32.8%
Percentage finer than 75 um: range 1.7% to 11.9%; mode 3.5%
Soundness loss: stone 1.2%; sand 1.5%
Sand equivalent: 80
Recommended usage: borrow, subbase, base (31.5 mm crushed), base and seal for asphaltic concrete.

The material is texturally variable and consists of coarse cobbly gravel, fine to medium gravel, gravelly sand, sandy silt and silt. The thickness of the deposit generally exceeds 3.5 m.

MECHANICAL ANALYSIS: N.A.

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
15	2.5	3.0	75 000

LOCATION:	N7-8	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Clair
STATUS:	Abandoned	**UTM:**	308 387

SECTION DESCRIPTION & COMMENTS:

Sections in this abandoned pit measure 4 to 5 m in height and expose fine sandy pebble gravel at the top (about 1 m) over stratified sand and silty sand. A few silt bands were observed. Clasts are flat and generally not larger than medium-pebble size. Striated bedrock is exposed at the base of the pit.

Several other pits have been opened in this ice-contact deposit. Most were abandoned in 1985. The estimate of recoverable reserves is for the entire deposit. The principal source area is along the esker crest.

MECHANICAL ANALYSIS:

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.				100.0	95.5	88.7	81.9	69.5	57.1	43.4	30.5

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
60	7	4	280 000

LOCATION:	N7-9	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pits	**PARISH:**	Lac-Baker
STATUS:	Active on demand	**UTM:**	297 411

SECTION DESCRIPTION & COMMENTS:

Sections in the deposit expose up to 8 m of material consisting mainly of well-stratified, texturally variable, medium to coarse sand and medium to coarse pebble gravel. Clasts are commonly flat. Small boulders, up to 40 cm in diameter, are common along the slopes and on the pit floor. Bedding was observed to dip 23° in a 065° direction. This suggests that the ice that occupied the valley was retreating toward the northwest.

The deposit has been intensively worked in the past and reserves are nearing depletion.

DOT (1973) tested the material and obtained the following results:

Los Angeles abrasion loss: range 33.1% to 42.4%
Percentage finer than 75 um: range 1.5% to 4.9%; mode 2.0%
Recommended usage: borrow, possible source of filter and blending sand, subbase and borderline base-course aggregate.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% A pass.	98.2	95.5	93.5	73.5	48.7	25.4	13.9	6.6	4.2	3.1	2.2
B							100.0	91.3	49.1	14.8	4.2

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 60%	Sound Lithotypes 40%
sandstone and siltstone 57; weathered 3	sandstone and siltstone 19; quartzite 17; quartz 4

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
11		4	Limited

LOCATION:	N7-10	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Baker Brook
STATUS:	Abandoned	**UTM:**	350 406

SECTION DESCRIPTION & COMMENTS:

A small kame terrace has been used locally as a source of gravel. DOT (1974, 1983) sampled and tested the material and obtained the following results:

Los Angeles abrasion loss: range 42.5% to 49.3%
Percentage finer than 75 um: range 1.4% to 3.2%; mode 2.4%
Recommended use: borrow, subbase, base (31.5 mm crushed)

The material consists of coarse gravel with large angular clasts up to 30 cm in diameter. The abundance of slate in the gravel is reflected by the high Los Angeles abrasion loss values. The kame terrace is narrow and bedrock is present a short distance west of the pit.

Similar small ice-contact deposits are probably present along the Rivière Baker-Brook valley.

MECHANICAL ANALYSIS: N.A.

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
4	0.5	3.5	17,500

LOCATION:	M7-11	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Baker Brook
STATUS:	Active on demand	**UTM:**	361 416

SECTION DESCRIPTION & COMMENTS:

A pit has been opened in a narrow kame terrace. The texture of the material is extremely variable. Sections expose up to 6 m of dirty cobbly gravel and fine to medium, moderately sorted sand. Bedding appears to dip south.

DOT (1978) sampled the material and obtained the following results:

Los Angeles abrasion loss: range 39.3% to 42.8%
Percentager finer than 75 um: range 5.5% to 21.6%; mode 13.5%
Recommended usage: borrow

The kame terrace may extend discontinuously along the Rivière Baker-Brook valley, further to the north.

MECHANICAL ANALYSIS: N.A.

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
7	2	2.5	50 000

LOCATION:	N7-12	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Alluvial	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Baker Brook
STATUS:	Active on demand	**UTM:**	351 419

SECTION DESCRIPTION & COMMENTS:

Sand and gravel are extracted from the alluvial plain of Rivière Baker-Brook. DOT (1978) tested the material and obtained the following results:

Los Angeles abrasion loss: range 34.7% to 44.6%; mode 41.0%
Percentage finer than 75 um: range 2.4% to 16.3%; mode 5.1%
Recommended usage: borrow and marginal subbase

Locally, the water table is encountered at depths ranging from 2 to 3.5 m.

Reserves for the entire Rivière Baker-Brook valley alluvial plain are evaluated at 2 million m^3. Only the higher terraces have good extraction potential.

About 300 m southeast of this locality, another pit was examined by DOT (1978). Results are as follows:

Los Angeles abrasion loss: range 30.2% to 36.1%; mode 32.0%
Percentage finer than 75 um: range 1.0% to 29.1%; mode 4.5%
Soundness loss: stone 1.5%; sand 1.5%
Sand equivalent value: 66
Recommended usage: marginal quality pit-run subbase, borrow, possible source of filter and blending sand.

MECHANICAL ANALYSIS: N.A.

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
587	100	2	2 million

LOCATION:	N7-13	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pits	**PARISH:**	Baker Brook
STATUS:	Active on demand	**UTM:**	348 473

SECTION DESCRIPTION & COMMENTS:

The deposit consists of mounds and ridges located in the Sisson Brook valley and its tributary, Ruisseau du Paradis. The deposit is discontinuous.

The material is well stratified and well sorted and consists mostly of fine to medium pebble gravel with some silty pebbly sand beds. More than 90% of the clasts are flat slate pebbles. Bedding appears to dip to the southwest.

DOT (1974; 1982; 1983) tested the material in the general area and obtained the following results:

Los Angeles abrasion loss: range 31.9% to 45.6%; mode 39.0%
Percentage finer than 75 um: range 1.2% to 13.7%; mode 3.9%
Soundness loss: stone 9.6%; sand 7.6%
Sand equivalent value: 69
Recommended usage: mainly as borrow material, but also as a source of subbase and base (31.5 mm crushed) although abrasion losses were noted as high for base-course and cover aggregate.

The reserve estimate includes that portion of the deposit in the area of N7-123.

MECHANICAL ANALYSIS:

sieve	31.5mm	25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.	100.0	96.5	94.7	75.9	51.6	29.6	15.5	5.1	2.3	1.5	1.0

LITHOLOGIC ANALYSIS:

Unsound Lithotypes 93%	Sound Lithotypes 7%
sandstone and siltstone 90; weathered 3	quartzite 4; sandstone and siltstone 2; quartz 1

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
85	8	3	240 000

LOCATION:	N7-14	**NTS:**	21 N/7
TYPE OF DEPOSIT:	Ice-contact	**COUNTY:**	Madawaska
EXPOSURE TYPE:	Pit	**PARISH:**	Baker Brook
STATUS:	Active on demand	**UTM:**	314 496

SECTION DESCRIPTION & COMMENTS:

A pit exposes an 8 to 10 m high section through an esker ridge in Ruisseau Petit-Reed valley. The section is partially slumped, but material exposed at the top is stratified. It consists principally of coarse, cobbly gravel and fine sandy pebble gravel. More than 90% of the clasts are flat-shaped slate pebbles. Rounding is poor. The largest clast size observed measured 30 cm in diameter. This is a proximal deposit.

MECHANICAL ANALYSIS: N.A.

sieve		25mm	19mm	9.5mm	4.75mm	2.36mm	1.18mm	600um	300um	150um	75um
% pass.											

LITHOLOGIC ANALYSIS: N.A.

Unsound Lithotypes	%	Sound Lithotypes	%

ESTIMATION OF RESERVES:

Total Deposit Area (hectares)	Area Workable (hectares)	Average Thickness (metres)	Recoverable Reserves (m^3) Probable
8	1.5	3	45 000

N6-100 UTM 971 328 (approximate)

A small pit exposes 4 m of till on the flank of the valley. Gneissic erratics are common in the general area, some measuring 2 m in diameter. This suggests a strong Laurentide Ice episode in the area.

N2-101 UTM 006 307

A small roadside excavation exposes texturally variable material: dirty cobbly gravel, laminated sand, and silty sand and well-sorted sand.

Immediately south of this location, a deltaic landform projects into Glasier Lake. Exposures are lacking, but a quick survey of the shoreline suggests that it is composed of poorly sorted sand and gravel. Reserves are conservatively estimated at 300 000 m^3, but more exploratory work is needed to evaluate the potential of this deposit.

N7-102 UTM 168 333

Striated bedrock is overlain by about 1 m of ablation till and glaciofluvial material. Shallow occurrences of sand and gravel are common along the Rivière des Crocs valley.

N2-103 UTM 191 318

A narrow kame terrace flanks the bedrock valley wall. A pit, now inactive, displays sections of stratified sand and gravel. Testing of the material by DOT (1981) gave the following:

Los Angeles abrasion loss: 23.7% and 25.3%
Percentage finer than 75 um: range 0.7% to 8.4%; mode 2.2%
Recommended usage: borrow, filter material, blending sand

Reserves are thought to be minimal, probably in the order of 50 000 m^3.

N2-104 UTM 172 324

An abandoned pit displays dirty, fine sandy pebble gravel. About 100 m north of the pit, a road cut exposes laminated silts, medium gravel, sand, and some boulders. The sorting of the material is variable. Similar material has been observed at locality N7-102 and elsewhere along the Rivière des Crocs valley. The material commonly occurs as a thin apron over the bedrock.

N2-105 **UTM 208 324**

The northern face of the pit is about 10 m high and exposes sand and gravel. The east face measures about 5 m high and consists of gravelly sand and sand. The deposit is interpreted as a kame terrace. Reserves are estimated at about 120 000 m^3 based on an operation depth of 3 m and an extraction area of 4 ha.

N2-106 **UTM 245 322**

An inactive pit displays sand over the bedrock slope. The material ranges in thickness from about 1.5 m to 4 m. The fines content ranges from 2.4% to 7.8% (DOT 1978). The extraction potential of this kame terrace is very limited.

N7-107 **UTM 295 333**

An abandoned pit displays some sand and gravel. No estimate of reserves has been calculated for the terrace extending between Crockett and Les Rapides along the Saint John River because the area is urbanized and there are indications that the thickness of material is limited (Rampton et al. 1984).

N7-108 **UTM 314 373**

A deltaic surface occurs at the mouth of Caron Brook. There are no exposures. Potential reserves of aggregate are estimated at 120 000 m^3.

N7-109 **UTM 213 377**

A small pit is operated on a demand basis as a source of fill. The exposures consist of stony ablation till over compact basal till.

N7-110 **UTM 210 382**

A road cut in a small kame terrace exposes about 2 m of sand.

N7-111 **UTM 200 405**

A small pit in a narrow flanking kame terrace is operated on a demand basis. The material is extremely variable - from coarse cobbly gravel to fine sandy pebble gravel. It is generally silty and poorly sorted. Many of the clasts consist of flat slate pebbles and there are a few Shield erratics. One large granitic gneiss boulder was observed; many of the

clasts are striated. Gravelly material is exposed continuously along the highway for another 1200 m north of this locality, but reserves are very limited.

N7-112 UTM 187 431

An inactive pit exposes about 2 m of shingle gravel. Approximately 500 m northeast of this locality, an abandoned pit exposes up to 1 m of dirty gravel. A wide valley links Lac Unique with Lac Long (Québec). The valley is inaccessible, but aerial photographs suggest that glacial deposits are present within it.

N7-113 UTM 275 360

An inactive pit exposes compact till and colluvium. Slate clasts are abundant. DOT (1983) tested the material and obtained the following results:

Los Angeles abrasion loss: 37.5%
Percentage finer than 75 um: range 12.9% to 20.2%
Recommended usage: borrow

N7-114 UTM 314 388

A small pit exposes dirty medium gravel with lenses of silt. DOT (1983) reports depths of up to 3.5 m. The percentage of material finer than 75 um ranges from 4.8% to 10.1% and the Los Angeles abrasion loss is 36.8%. The material was recommended for borrow only. Reserves are probably limited.

N7-115 UTM 278 423

This pit, mostly abandoned but showing some signs of activity, exhibits 4 m sections of glaciofluvial material overlying bedrock. Deformed bedding and wide textural variations have been observed. Reserves of aggregate are estimated at about 40 000 m^3.

N7-116 UTM 244 447

Most of the island has only a thin superficial cover over the bedrock surface, but at this locality, some sand and gravel were noted. The potential for extraction is probably nil.

N7-117 UTM 240 456

Sand and gravel are exposed along a road cut and cover the lower portion of the valley, along the highway, northwest of this locality. Exposures are lacking and the area is densely

occupied by summer residences. Aerial photograph interpretation suggests the presence of an ice-contact deposit at the outlet of Lac Baker. Potential reserves are limited by cottage development.

N7-118 UTM 232 465

Sand and gravel occur along the road, but have limited potential as a resource. The deposit flanks the bedrock valley slope and is thin and patchy, as indicated by a DOT field report (83-59).

N7-119 UTM 250 468

A 2.5 km long and narrow esker occurs in the Branch à Jerry - Rivière Baker-Brook valleys. It is exposed in a small, abandoned pit. Potential reserves are estimated at 100 000 m^3, but extraction of the material is limited by the narrow width of the deposit and its proximity to streams.

N7-120 UTM 296 469

A small abandoned pit exposes 2 m of slaty gravel. Limited quantities of low-grade aggregate can be found along the flat outwash plain. Only the higher terrace has any significant potential.

N7-121 UTM 311 461

A small inactive pit exposes sand and gravel at the northwestern end of a small esker. Reserves are limited.

N7-122 UTM 332 435

An abandoned pit exposes sand and gravel on the upper (outwash) terrace. DOT (1983) sampled the deposit and obtained the following results:

Los Angeles abrasion loss: range 28.5% to 35.6%
Percentage finer than 75 um: range 1.4% to 15.4%; mode 4.4%
Recommended usage: borrow and marginal subbase

Testing by DOT indicates working depths of up to 3.5 m. The deposit generally displays 1.5 m of fine medium gravel over fine sand or silt. Estimated quantity: 100 000 m^3.

N7-123 **UTM 356 491**

A kame terrace is worked on a demand basis as a source of borrow material. The pit exposes 6 to 7 m of stratified sand and sandy pebble gravel. North, across Ruisseau du Paradis, there is a very narrow kame terrace, containing only minor reserves of aggregate.

N7-124 **UTM 377 473**

A small kame terrace, located mostly within the Edmundston (21 N/8) map area, contains limited volumes of fine to medium dirty "slaty" gravel. During testing by DOT (1981), bedrock was encountered at depths ranging from 1 to 2.5 m. The percentage of material finer than 75 um ranges between 9.2% and 12.3% and the Los Angeles abrasion loss was 36.3%. The material was recommended for use as borrow only.

N7-125 **UTM 373 494**

At the present pit site, the deposit is nearing depletion. An examination of aerial photographs suggests that the deposit extends 500 m to the southeast. Testing of the material by DOT (1973; 1982) gave the following results:

Los Angeles abrasion loss: range 32.9% to 35.4%
Percentage finer than 75 um: range 0.7% to 25.8%; mode 2.4%
Recommended usage: borrow, subbase, and base (31.5 mm crushed aggregate).

N7-126 **UTM 348 528**

A long and narrow esker, located at the head of Petite Rivière à la Truite contains an estimated 2 million m^3 of material (DOT 1981). Testing by (DOT 1981; 1982) gave the following results:

Los Angeles abrasion loss: range 26.2% to 37.4%; mode 35.1%
Percentage finer than 75 um: range 1.7% to 12.3%; mode 4.1%
Recommended usage: borrow, subbase, base (31.5 mm crushed) and filter material.

The material varies from gravelly sand and medium sand to coarse gravel. Some sandy silt occurs locally.

MAPS NOT

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CARTES

OMISES